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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS

FOREST PRODUCTS

FOREST ECONOMICS

RANGE RESEARCH

APR - 1933



BRANCH OF RESEARCH

April, 1933

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APPALACHIAN FOREST EXPERIMENT STATION

General

The report "Measures for Stand Betterment in the Forests of the Southern Appalachian Region" was completed and forwarded to Washington. This report was prepared as a guide for silvicultural work to be done by the civilian conservation corps on National Forest lands in the region. In the report an attempt was made to classify the Appalachian forest into stand units in which a single silvicultural treatment would apply. This classification was put into chart form so that each treatment unit or stand unit is shown separately with the silvicultural treatment recommended. Modification of these treatments for different types are discussed separately as are the general procedures for various forest improvement measures.

During the month several members of the Station staff visited areas in the Mills River Drainage of the Pisgah National Forest for the purpose of selecting one suitable for an experimental forest. All of this watershed has been cut over within the last sixteen years. The chief problems to be studied on this proposed experimental forest deal with the rehabilitation of cut-over lands.

Fire studies - Coastal Plain

MacKinney has completed the rough draft of a paper on factors affecting bark thickness of second-growth longleaf pine. He found that dominance and height had no appreciable effect on bark thickness. Fifty-nine per cent of the variations in bark thickness were associated with variations in diameter.

Results of the analysis also indicated that direction had no appreciable effect on the bark thickness. Errors of measurement were much smaller than variations from tree to tree within a diameter class.

Fire damage - Mountains

Analyses of temperature and humidity records taken from a plot experimentally burned in December, 1932, and an adjacent control plot, were made. A comparison of the records obtained from September preceding the burning until the following April indicated no differences between the plots ascribable to fire.

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CALIFORNIA FOREST EXPERIMENT STATION

Forest Management - Pine Region

Plans were tentatively made during the month for using men from the C.C.C. on some of our projects this season. The work planned includes mapping and cruising experimental forests, general improvement work, large scale thinning, pruning studies, remapping the older methods-of-cutting plots, study of release following logging, and studies of losses following logging. With the

(Over)

exception of improvement work, most of the work contemplated will require technically trained men.

Early in the month plans were made with Meyer of the Pacific Northwest Station for collecting data for the cooperative rangewide study of ponderosa pine yields. Some of the old plots on which the yield data furnished him are based were revisited, and areas were scouted for the location of new plots. At present work is progressing on selecting and measuring new plots, of which we hope to get about 100. In connection with the work the permanent yield and thinning plots due this year are being remeasured.

At the Stanislaus Branch Station instruments were installed at the three site factor and competition stations and possible locations selected for a fourth station in virgin timber. Tree growth records were started sufficiently early to determine when growth starts at each 1000 foot interval from 2000 feet to 6000 feet elevation, inclusive.

In the office a start has been made in planimetering the permanent reproduction quadrat maps. The areas are classed as follows:

1. Areas from which reproduction is excluded, such as logs, rocks, slash piles, trash, stump and tree bases.
2. Areas covered with shrubby vegetation, with further subdivision into species and mixture represented.
3. Bare, burned, and litter covered areas.

Reproduction is recorded by number of seedlings and species with the area classification. At present we are attempting to determine how completely the area was utilized by vegetation before logging, what changes took place due to logging, and how the area is utilized five years after logging. The office work has shown us the need for more detailed mapping, such as showing the area completely covered by logs, rather than mapping only the projection of log edges on the ground, and showing litter by depth and character on the map rather than by written description.

Forest Management - Redwood Region

Person and Hallin took advantage of Meyer's visit to work out the details of a proposed study of site classification. A three day trip was taken through Humboldt and Mendocino counties in the course of which a large number of redwood second growth stands were examined as to their suitability for site classification and yield plots. Although many examples of fine height and diameter growth for redwood second growth were found it is apparent that considerable difficulty will be encountered in trying to find fully stocked stands.

We were able to impress Meyer with the size of redwood by showing one tree which is 362 feet in height and the stump of another which at D.B.H. outside bark must have measured 22 or 23 feet in diameter. A fine Site I spruce stand about 60 years of age was also visited and some measurements taken.

Forestation

Kennett Area

Of outstanding interest in forestation during the past several months has been the initiation of an "indicator" experiment in the famed smelter-fume-denuded area along the Sacramento River near Kennett. Advance of the cover-type map in the area had revealed the occurrence of considerable scattered but thrifty reproduction of ponderosa and knobcone pines. An examination by Wieslander and Kraebel in early March suggested the suitability of this area for treatment under the President's conservation program, which was at that time still only a rumor. The project would be proposed as a land-reclamation effort for the combined purposes of (1) erosion control to stop the heavy and continuous discharge of soil into the Sacramento River and into what will be a few years hence the great Kennett reservoir, and (2) the reestablishment of coniferous forest on sites previously so covered.

The experimental work was designed to give a one-season indication of (1) the value of certain cover-crop species for surface soil control, (2) the possibility of establishing native willow cuttings in the gullies, (3) the reaction of pine seedlings and seedspots of appropriate species planted in apparently favorable sites in the vicinity of established natural reproduction. With the enthusiastic cooperation of Prof. G. B. Bodman of the University Division of Soil Technology, Kraebel installed a series of soil treatments, including lime, phosphate and nitrate, based on soil tests made by Bodman four years ago. In addition to the two-year old trees of ponderosa pine planted in the treated areas, sour clover, barley and oats were also sown. Other species either sown or planted in untreated soil included 1-1 Jeffrey and knobcone pines, 1-0 seedlings of ponderosa pine, white and sour clovers, Trieste and black mustards, and barley.

The need for reclamation of the area is strikingly evident from the sharp cutting and enlargement of gullies which are continuing to dissect the country at a rapid rate under the average annual precipitation of 64.79 inches. During a rainstorm on March 12 the streams issuing, heavily laden with red soil, from the Kennett area into the gray-green Sacramento River maintained their identity as a broad tomato-colored band along the west bank for miles down the river. Native vegetation, growing chiefly from root-sprouts, includes Rhus diversiloba, Aesculus californica, Cercis occidentalis, Arctostaphylos spp., Umbellularia californica, Philadelphus lewisii, and abundant Salix in the bottoms. Among grasses, Festuca reflexa is most abundant, especially on re-deposited soil.

Since the ridge surfaces between gullies are now partially protected by erosion pavement, reclamation of the area on a large scale would most profitably begin by control of the gullies by a combination of willow cuttings, set thickly in the gullies, and check-dams of native materials set sparingly in strategic places.

Forest Survey - Type Map

Site Mapping

Wieslander spent a week in the field with the type mapping crews instructing them in the application of the new site index curves (average height of dominants on age) recently developed by Dunning. It was found that the sites heretofore mapped on the basis of the average height of the tallest 10 per cent of the trees in the old-growths have in general given too low site values for the better sites on the west slope of the Sierras. This has been due to two reasons. First, because over large areas the tallest 10 per cent of the trees have been culled out during the early mining days, and second, because of variability in the general age-class of the so-called mature stands. Dunning's site index curves climb steadily between the age of 200 and 500 years so it is necessary to determine the approximate age of the dominant stand before site values can be correctly ascertained. In many stands this can only be done by the use of a long increment borer. This was done in connection with a field check of previous site mapping with the result that the map was simplified. There were fewer sites.

Range Research

During April the climax of growth of herbaceous forage was reached and passed at the lower levels of the Sierra Nevada foothills of the San Joaquin Valley. Drying of this forage crop of short-lived annuals is steadily progressing upwards to higher levels. The bulk of the effective time of the grazing group has been devoted to obtaining records on growth and development of important plants of these ranges, during this critical period of the season. Significant trends of these forage records are not yet available.

Erosion - Streamflow

San Dimas Watershed Study

Construction of the dams and reservoirs for the Bell Canyon triplicate watersheds continued.

Drawing up specifications for standard and automatic rain gages and for stage recorders to use at the dams has required special attention. For example it is necessary to employ a less expensive rain gage than that now considered standard when several hundred are considered. It also permits a design to avoid the perennial dissatisfaction with the wooden measuring stick. For this time-honored inaccuracy of measuring rainfall, it is proposed to substitute a volumetric method. By designing a funnel of such diameter that 1.0 inch depth of rain equals 1000 cc, it is possible to use the standard 1000 cc stock graduates into which rain catch is drained and measured. The problem confronting us, however, is whether we use a standard 8" funnel which factories are set up to make and have special graduates made to measure to hundredths of an inch, or to use the odd size funnel with easily available and inexpensive graduates.

Erosion Control

Burns

Matilija Burn. The rather widespread dissemination of information regarding our seeding effort on the big burn of the Santa Barbara Forest has placed the Station in the difficult position of being asked to furnish suggestions for similar work elsewhere before we have observed the results of our own pioneer work. During the past two weeks, however, Ilch and Gleason have been making the first detailed examination, and Kraebel's visit reveals the following high-lights:

Trieste mustard is outstanding as the best species, having made a satisfactory cover on good soils from a sowing of 3.9 pounds per acre. A maximum of 5 pounds per acre should suffice for future sowings for this purpose on all sites.

Black mustard is next, but requires 5 pounds or over to produce a stand equal to that of Trieste mustard. Both species had attained a height of 24 to 40 inches and were in flower and first fruit at examination.

The clovers, white and sour, are about equal, and averaged less than six inches in height at examination.

There is a decided scarcity of plants on most of the higher and steeper slopes and an increase in density on the lower slopes. High winds lifted away the loose fine soil from the upper, more exposed slopes, leaving seed exposed on hard dry soil, rolling seed down hill, or actually lifting and redistributing the seed into the present position of plants. Excessive drying of exposed upper slopes was another deterrent to cover establishment.

Gullies, formed by the heavy January storm before active germination, are now conspicuously marked by denser growth of control plants. Thus, the natural channels for run-off being blocked, the protective effect of the introduced vegetation against erosion should become apparent during next rainy season.

Areas seeded by airplane show results in general similar and equal to those on hand-sown areas.

Measurement of the erosion-pins on slopes showed no startling changes, the principal sheet soil movement since the fire having occurred by wind and gravity action previous to their setting. Shoestring gullies were cut on practically all lower slopes by the mid-January storm, but large coalescing gully "systems" are comparatively rare. Reason for this is the fact that all heavy precipitation on the burn has thus far fallen in the form of snow.

While this cursory analysis of results does not justify recommendations for great extension of this sort of work, plans are tentatively made for sowing an additional area of 5000 acres in the Matilija Burn next autumn as a minor project of the Conservation Corps program.

Roads

Forest highways under construction in the Angeles Forest have been pushed forward vigorously during the past winter. Attendant damage from erosion of the new fills and overcast slopes brought forth urgent requests for specific written instructions covering the methods of slope fixation developed in our experiments. A pamphlet prepared by Kraebel was issued in mimeographed form with the title: "Erosion Control on Mountain Roads." The methods described are "intended to serve as suggestions, rather than specific instructions, for the guidance of men in charge of road construction projects in the national forests of California," and emphasizes the need for varying treatment to meet the characteristics of each project.

Grizzly Peak Boulevard. A fine scenic "skyline" boulevard, under construction in the Berkeley Hills above the University campus, has been made conspicuous by numerous large fill slopes, several of which caused serious trouble by contributing huge mud flows upon an older lower road. Removal of the mud after each storm cost Alameda County from \$700 to \$1000, in addition to the uncomputed damage to the new road. The County Engineer was therefore glad to undertake control work.

The first slope undertaken was the most troublesome, a large amphitheatre with a slope of 80 per cent. On March 15, before control was started, a rain of approximately 0.5 inch had caused a very bad mud flow. On March 28, after the slope had been 75 per cent controlled, a rain of approximately 1.0 inch, delivered in a heavy downpour during a few night hours, produced no run-off whatever. Next morning only one small gully was observed on the slope. This had originated on a large rock outcrop and the untreated section of slope, but had been stopped by the contour wattles before reaching the foot of the slope.

Fire Research

The major portion of the month was spent in the preparation of material for several sessions of training in visibility mapping and detection planning.

Twenty forestry school men were trained in the technique of mapping seen areas on topographic and drainage maps. These men will be divided into six-man crews, each crew completing visibility mapping on a Forest and then moving on to the next Forest. It is planned that all of the field work in connection with detection planning will be completed by September 1. The planning will be done currently as each Forest's mapping work is completed.

In addition eleven Forest Staff men were trained in both the mapping and planning phases of the work. This training was for the purpose of fitting the officers for supervision of the mapping crews and for aiding in the preparation of detection plans for their Forests.

In the radius of vision study considerable work was done toward the completion of the analysis radius of vision data gathered in 1932. Charts were made up to illustrate the degree of impairment of visibility by hours, days and directions as well as the causes of impaired visibility conditions.

Products

Logging and Milling Studies

The final report of the Stanislaus study will show costs, values, and margins on the 1932 basis in addition to the detailed data on time costs, grade production, etc. In the previous report (Bul. 549, Cal. Agr. Exp. Sta.), results were presented entirely in terms of dollars and cents on the 1928-29-30 basis. At the moment, computation of new log and tree values, with discount for depreciation by lumber grades and thicknesses, is just being started, so it is impossible to compare final selling values. A showing of approximate percentage decline in values from 1929 to 1932 may be made, however, on the basis of green-chain grade production without allowance for depreciation.

Comparative Selling Values per M.B.M. of Pine Trees in
1929 and 1932, Stanislaus Study Area, With
no Discount for Depreciation

D.B.H. Inches	Sugar pine			Ponderosa pine		
			Per cent			Per cent
	1929	1932	decrease	1929	1932	decrease
16	27.23	18.83	30.8	26.11	17.16	34.3
24	26.19	17.44	33.4	28.06	18.64	33.6
32	29.53	20.54	30.4	31.17	21.12	32.2
40	34.77	25.41	26.9	33.82	23.15	31.5
50	42.55	32.84	22.8	34.86	24.11	30.8
60	48.19	38.33	20.5	35.49	24.57	30.8

Sugar pine held up better on the average than ponderosa pine but the small trees decline about the same rate.

According to the Regional Logging Engineer's figures just collected, operating costs have declined about 21 per cent. Correlated with the decline in values, this indicates that the smallest pine trees logged without loss in 1932 were about three inches larger in diameter than the zero-margin sizes of 1928-29-30, i.e., around 27 inches instead of 24 inches.

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CENTRAL STATES FOREST EXPERIMENT STATION

Farm Woodland Management

The cooperative bulletin "The Natural Regeneration of Farm Woods Following the Removal of Livestock" made its appearance early in April. Distribution of this publication has been handled largely by the Purdue Agricultural Experiment Station.

Day and DenUyl visited the Pinney-Purdue farm on April 26 for the spring examination of the carrying capacity study plots. They found that the season was so late and vegetation so retarded that it will be inadvisable to place the cattle in the fenced pasture tracts before May 10.

Black Locust Volume Tables

Kellogg completed curving the 400 black locust stem measurements and Miss Petty planimetered them for total and merchantable cubic volume. The presence of stem irregularities caused by locust borer attack, results in very grotesque tree forms. By taking measurements at only periodic distances, fairly smooth graphs are secured. However, the irregularity of hardwood tree forms in contrast to conifers is emphasized.

Forest Site Study

Further laboratory tests of the physical character of black walnut plantation soils were made during April by Kuenzel. Samples of the A₁ horizon from plots in Illinois, Indiana, Ohio and Kentucky were analyzed by the Bouyoucos hydrometer method.

Chestnut Oak Regeneration

The Indiana chestnut oak regeneration plots were remeasured. Within the uncut check plot there is apparent a constant decrease in the number of seedlings, and a steady diminishing of the vigor of the survivors. Within the partially cut plot on which the basal area of the overhead stand was reduced by 50 per cent, the reproduction has grown a little better, and the seedlings have made a little more height growth than have those of the check plot.

Within the clear-cut plot chestnut oak reproduction has become established very satisfactorily, and the area is well stocked with seedlings, some of which are now more than 30 inches in height. At the same time stump sprouts range from 6 to 14 feet in height. It is planned to carry on a comparative study of these two kinds of reproduction on this area.

Locust Borer Study

Hall spent the period of April 4 to 8, inclusive, with Extension Forester L. E. Sawyer of Illinois, locating areas on which cooperative control experiments on the locust borer can be carried on with the Natural History Survey of Illinois. Four areas in all were located and on one area a clear cutting experiment was started.

A similar trip was made in Indiana from April 26 to 29, inclusive, with Extension Forester T. E. Shaw and Professor J. J. Davis of Purdue University. Four areas were located in the state where it will be possible to carry on cooperative control experiments on the locust borer with the Purdue Agricultural Experiment Station.

Hall and Cummings are conducting field work in cooperation with the locust site study crew. It is planned to carry on a study of the number of young active larvae on about twenty trees for each plot; these studies to be followed in the fall by an emergence count to determine the number of larvae surviving.

During the period of April 10 to 25, inclusive, 2,100 year-old locust seedlings, which had been grown in the nursery bed at Columbus, were planted. Three different planting sites were selected, one on the Ohio State University property, another on the Mengert property near Butler, Ohio, and the third on the Barton property at Rushville, Illinois. The planting stock used was that which had been grown from seed collected both from badly infested locust trees and from those which showed no locust borer attack.

The period of April 17 to 22, inclusive, was spent by Cummings and Jordan near Rushville, Illinois, on a cooperative cutting experiment for locust borer control. An area of about an acre of badly infested locusts, nine years in age, was clear cut and stem analysis of a number of the cut trees was made so that a comparison will be possible between the original seedling growth and subsequent sprout growth.

Additional experiments were carried on during the month to determine the effectiveness of using stem and root cuttings in propagating locusts.

Tip Moth Infestation

While in Tennessee, the State nursery was visited at Jackson. During this visit, a young mixed planting of slash, pitch, short-leaf and long-leaf pine was examined which showed a very serious tip moth infestation. The slash and short-leaf pine had 100 per cent of their tips killed during the 1932 season. The pitch pine showed about 50 per cent of the tips killed, while the long-leaf was practically free. It was impossible to determine the species which was causing this injury but it appeared more like the work of the native tip moth than that of the European pine shoot moth. Due to the seriousness of this infestation, it is felt that a study should be made of this insect some time during the coming season to determine the species which is working in this area and something on its distribution. Such a study would be warranted on the grounds that their present planting progress in the Tennessee basin project calls for a high percentage of short-leaf pine.

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NORTHEASTERN FOREST EXPERIMENT STATION

Reineke has made a critical analysis of "A Simple Method of Constructing Tree Volume Tables" by Demeritt and McIntyre, Jour. Agric. Res., 44:6, March 15, 1932. This method of constructing volume tables by means of alignment charts is based on the gross correlation curves of volume over d.b.h. and volume over total height rather than on the net regression curves fundamental to the base chart method developed by Reineke and Bruce. The method for locating the volume axis prescribed by Demeritt and McIntyre does not

result, as claimed, in a straight axis parallel with the others, but produces a curved axis, the curvature depending on the shape of the graduating curves used for d.b.h. and height. The use of the curved axis will give a better chart.

After graduating the various scales, Demeritt and McIntyre test the accuracy of the chart by a method which will result always in a perfect result, barring gross misfitting of the graduating curves. When the correct test is applied, the need for modifications of the scales is apparent. To eliminate the errors at least as many estimates are required by this method as by the base chart method of Reineke and Bruce. The base chart method was applied to the data published by Demeritt and McIntyre, and the average error of the resulting chart was very much smaller than that of the chart given in the article.

As compared with the base chart method, the method presented by Demeritt and McIntyre is limited in applicability, since it cannot be adapted to the curved-axis charts required for board feet tables, and there is no reduction in time required, since several estimates are needed and additional time is absorbed in graduating the three scales.

Stewart and Morey have established an experimental planting on the land of the New Haven Water Company near New Haven. The object of this experiment is to determine the effect on survival, growth and root development, of various depths of planting in relation to the method of planting. Blocks of three hundred trees each have been set at four different depths by three methods. One series was planted with the use of the Harvard tool, another series by the slit method with grub hoe, and the third spreading the roots in a shallow dug hole. 2-0 stock of red pine, white pine, and red spruce was used. Similar plantings with both transplant and seedling stock will be established on another soil type in New York State.

MacAloney has spent some time scouting for the beech scale in southern New England with negative results up to the present. In his travels he has, however, discovered some new points of infestation of the pine shoot moth which extend its known distribution up the Connecticut River Valley to Springfield, Massachusetts.

Dr. Spaulding has been making preliminary studies of the danger from butt rot when young sprout stands are thinned by cutting out all but one or two of the sprouts from each stump. Some immediate information on this point will be of value in connection with the operations of the Conservation Corps.

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NORTHERN ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Sustained Yield Plan

In connection with the often discussed idea of merging all private timber with State and Federal in a series of sustained yield units, a tentative calculation has recently been made for western Montana and north Idaho. The Region One office of Forest Management and the Section of Forest Products of the Northern Rocky Mountain Forest and Range Experiment Station together prepared the report.

North Idaho was divided into three units or working circles. These units practically cover the white pine type, including the area east of the Pend Oreille River in Washington and west end of the Clarks Fork River drainage in Montana, but excluding some forest acreage and volume just north of the Salmon River in Idaho. The three western Montana working circles include practically all of the forest area west of the Continental Divide in the State. The working circles are necessarily large, to fit in with a broad plan of management, and in some cases may sustain two or more mills.

The timber estimates are presented in two ways: first, the total volume of saw timber, regardless of location, species, or accessibility; second, the timber in Zone One, which is defined as areas that could be logged without a fundamental change in lumber prices as they have existed in the past, assuming of course a progressive development of logging improvements. The same division is made for timber-producing areas.

In most of the working circles, the estimate of available timber was based on the amount of white pine and ponderosa pine which would fall in Zone One. To this amount was added a percentage of mixed timber equal to the past average cut. Two exceptions were made to this plan. For one unit, 600 million feet of spruce was considered in Zone One in addition to the indicated percentage of mixed; and in another unit all of the mixed timber in Zone One was included, as the cut in that unit is not based primarily on the pine.

The results of the calculation are shown in the following tables:

Table A

Unit	Total	Available	Zone 1	Sustained	Average Mill Cut
	Timber	Tbr. (Zone 1)	Area	Annual Yield	(1929-31)
	M.M. Ft.	M.M. Ft.	Thousand	M.M. Ft.	M.M. Ft.
	(Lbr. Tally)	Lbr. Tally	Acres	Lbr. Tally	Lbr. Tally
Clearwater	26,484	11,433	1,291	197	312
Coeur d'Alene	13,258	6,537	1,684	109	235
Sandpoint	9,110	4,075	1,660	68	212
North Idaho	48,852	22,045	4,635	374	757
Kootenai	7,036	3,168	845	51	56
Kalispell	15,563	8,029	908	126	84
Missoula	15,216	7,985	2,107	129	106
West. Mont.	37,815	19,182	3,860	306	246
TOTAL 6 UNITS	86,667	41,227	8,495	680	1,003

"Average mill cut" is apt to be misleading because of the long distances logs are sometimes hauled. Considerable quantities of logs have, in the past, been railed over the C.N. from western Montana into Idaho and even to Spokane. I have no data on the extent to which logs were hauled across these theoretical working circle lines during 1929-31. - E.E.C.

Table B

Ownership	Saw Timber in Million Feet - Lumber Tally				
	Total	Per	Available	Per	Per cent of
	Amount	cent	Zone 1	cent	Total available
NORTH IDAHO WORKING CIRCLES					
National Forests	20,935	42.9	7,065	32.1	33.7
Public Domain	234	0.5	67	0.3	28.6
Indian Reservations	58	0.1	50	0.2	86.2
State	7,087	14.5	3,878	17.6	54.7
Private	20,538	42.0	10,985	49.8	53.4
Total	48,852	100.0	22,045	100.0	45.1
WESTERN MONTANA WORKING CIRCLES					
National Forests	20,643	54.6	8,245	43.0	40.0
Public Domain	464	1.2	37	0.2	8.0
Indian Reservations	1,208	3.2	1,065	5.6	88.2
State	2,590	6.9	1,904	9.9	73.5
Private	12,910	34.1	7,931	41.3	61.4
Total	37,815	100.0	19,182	100.0	50.7
ENTIRE UNIT (6) WORKING CIRCLES					
National Forests	41,578	48.0	15,310	37.1	36.8
Public Domain	698	0.8	104	0.2	14.9
Indian Reservations	1,266	1.5	1,115	2.7	88.0
State	9,677	11.2	5,782	14.0	59.7
Private	33,448	38.5	18,916	46.0	56.6
Total	86,667	100.0	41,227	100.0	47.6

Stumpage Prices

Stumpage transactions in Region One during the past year were the lowest in number since the Office of Products started compiling these data. Only two Forest Service sales over 200 M feet in volume were reported for the twenty National Forests in Region One. The largest of these was on the Custer Forest in eastern Montana and contained a volume of 686 M feet of ponderosa pine at \$2.75 per M. The highest and lowest price reported for western white pine by private concerns in Idaho was \$8.00 and \$2.79 per M, respectively.

Census

Including schedules obtained by Region 4 from mills in southern Idaho, 156 lumber census returns were edited during the past month. On April 22, 371 completed production schedules, 117 stumpage and log price reports, and 17 lumber distribution schedules were forwarded to Washington. Production figures based on reports of large mills included in this shipment were used by the Bureau of the Census in a preliminary statement issued on April 29. In contrasting the cut by identical mills in 1931 and 1932, the statement shows for 1932 a decrease of 49.5 per cent in the lumber cut of Idaho and Montana. The 1932 canvass of these states is now at least 90 per cent completed.

Range Research

Field work in range research received a severe set-back this season through the detail of Hurtt to the Washington Office for a period of six weeks starting May 5. While part of the loss can be made up by the use of additional field assistants, the major phases of this project will be delayed.

The native forage in the experimental pasture at Miles City began growth somewhat earlier this season than last. Records of plant development show that on April 28, about 70% of the grama grass plants had begun growth, and that the average leaf length of bluestem (*Agropyron smithii*) was from 4-1/2 to 5 inches. This latter species and many other important forage grasses, excepting grama grass and buffalo grass, began growth on or about March 15. The development records were taken from plots established this season. The start the forage has made and the favorable condition of the soil moisture at the present time indicate a good forage crop for this year.

The plot of crested wheat grass which was sown at the station in 1932 has survived the winter in excellent condition, and is making a showing this spring that exceeds the growth of the native wheat grasses on similar sites. The average basal leaf length was from 5-1/2 to 6 inches on the higher ground within the plot, while in the swales many of the clumps exceeded 10 inches in leaf length. This record was made on April 19. From this early development and high per cent of survival from last season, this species shows favorable promise as a forage plant to be used in revegetating abandoned plowed up lands in this region.

Steady gains have been made by the cattle in the winter experimental pastures for the past month. The lots in the heavily grazed pastures are considerably thinner than those in the moderately and lightly grazed pastures. About 50% of the cows have calved to date, and from appearances they should calve about 95%. It is interesting to note that the average birth weight of the calves from the cows in the heavily grazed pastures is exceeded by those from the cows in the moderately and lightly grazed pastures by 5.8 pounds (about 8%). The heaviest calf at birth was 83-1/2 pounds from one of the lightly grazed pastures, while the lightest individual calf at birth was 50-1/2 pounds from one of the heavily used pastures. Although this datum is incomplete, it has its possibilities of meaning something.

The area of three of the summer pastures has been changed in accordance with the grazing reconnaissance check made last season after the pastures had been fenced. The fencing has been completed on the revised pasture boundaries. It is planned to move the cattle from the winter pastures to these pastures on May 12.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Section of Silviculture

Experimental Forests - The branch station at the Wind River Experimental Forest was opened for the season on April 10. From the C.C.C. camp to be located at Wind River we expect to obtain the necessary labor to build 18 miles of road and 9 miles of trail in the experimental forest. Snags will be felled on 2,000 acres of old burn included in the forest, and it may also be possible to do some thinning and planting experiments.

Another camp will be located 10 miles from the Pringle Falls Experimental Forest, and present plans call for considerable improvement work at Pringle Falls using C.C.C. labor. Among the jobs contemplated are bridge construction, building a lookout tower, slash disposal and general clean-up along all new roads, preparation of camp sites, fencing, including four miles of fence around parts of a natural area, a small amount of road building and various miscellaneous improvement work.

Wind River Arboretum - The annual spring arboretum transplanting was done in mid-April. Thirty-three different species were transplanted in the arboretum nursery. For some of these species there were more than a hundred trees. No new lots were outplanted in the arboretum this year, but some replacements were made where loss had occurred during the past year. The arboretum specimens with but few exceptions have survived very well the several severe cold spells of the past winter, although the foliage of some of the conifers was browned above the snow line. In the nursery there was a high mortality in the young seedlings due to low temperatures and to frost heaving of the soil.

Douglas fir natural reproduction - Substantial progress was made in completing reports on various phases of the reproduction-after-clear-cutting study. Plans are being made to expand this study to include the several forms of partial cutting now being discussed in the Douglas fir region. In this work close cooperation will be maintained with the personnel handling the slash disposal and fire studies.

Ponderosa pine - Methods of Cutting - Numerous data on production costs were assembled by Kolbe preparatory to analyzing the comparative silvicultural and financial advantages to be obtained in cutting ponderosa pine by several methods. The methods of cutting under consideration are: clear cutting, 16-inch diameter limit, F.S. standard selection cutting, and a light selection cutting in which about 50 per cent of the original volume is removed. Permanent sample plot data, the findings of the various mill scale studies and the growth and yield study results are providing excellent bases for the present analyses.

Fire Studies - A very large part of the month was required to prepare the fuel inflammability sticks which are to be sent to each forest of the region for measurement of the seasonal fire hazard. More intensive work on this project will be done at Wind River. Several hundred sticks have been prepared. Another large job was the construction of 35 lookout eye-test outfits. Several changes were made in the design of this test, and it was necessary to make various checks to avoid possible changes in accuracy. This test was announced as being still in the experimental stage, but the Washington office has asked each region to try it during the coming season and Region 6 is asking each forest in the region to use the test. Hence the large number of outfits required.

Douglas Fir Seed Study - Computations for the "heredity" study of Douglas fir were practically completed during the month, and substantial progress made by Morris and Munger in writing the report for this project.

Mensuration

In order to extend the interregional yield study of even-aged ponderosa pine to California, Meyer spent some time in northern California visiting possible study areas with Dunning and others. It is planned that a number of temporary plots will be taken in even-aged stands to combine with similar plot data for existing material taken in other regions within the pure ponderosa pine type. Meyer was prepared to encounter the excellent site conditions which prevail in certain parts of California, and he was not disappointed in this. Unfortunately the range of age classes in the California even-aged stands is very small, but remeasurement of older plots will add ten or more years to a number of the records. In the preparation of the yield tables, careful consideration will have to be given to a large group of plots between 60 and 70 years old on good site conditions; otherwise a bad warping of the graduation curves will result. The present yield table technique will have to be revised somewhat to take care of this exigency.

The literature is being studied and working plans are being prepared for a growth and yield study of the spruce-hemlock type of the fog belt.

This study will have to include uneven-aged stands as well as even-aged stands and clear cutting as well as selection cutting. In addition a great variation in composition will have to be anticipated, since stands of this type can vary from pure hemlock or pure spruce to pure Douglas fir through any intermediate mixture. Incidentally this study will yield much data upon the interrelationship of the various species, so that the establishment of a single set of site quality classes for all types in this region will be feasible.

Section of Products

General - Lodewick represented the Station at the Fifth Annual Sawmill Engineering Conference in Tacoma, April 20-21.

Fewer requests for information have been received during the month, but they have been as varied as usual. An inspection of sections of questionable piling was made upon the request of the Office of U.S. Engineers. The same office called for information relative to lumber production in the Coos Bay Region for the period 1925-1931 inclusive. There have been several inquiries as to the comparative strength properties of the eastern and western ashes.

Information was furnished as to the possibilities of using Douglas fir stumps as a source of turpentine, thus reducing the cost of clearing land. An attempt was made to locate for the Madison Laboratory the source of granulated wood used in the packaging of California grapes. Federal creosoting specifications were furnished a local producer. Information about white fir was furnished a party interested in the possible use of this species in novelty containers for apple syrup.

Revision of the remaining files, which had been postponed since last year, was completed during the month.

Lumber, Lath and Shingle Census - During the month 514 fourth requests were sent out. To date 1,375 acceptable schedules have been forwarded to Washington, 369 were forwarded during this month. Johnson spent eight days in the field in Oregon picking up delinquent companies.

Douglas Fir Mill Scale Studies - Computations have been completed for the two studies made last spring, and the reports should be under way during the next month.

Motor Truck Log Hauling Study - Repraeger has completed the final report on this study which dealt with the engineering, economic, and forestry aspects of motor truck use in log hauling. The manuscript has been accepted by The Timberman for publication in serial form. The first installment will probably appear in the May issue.

Selective Logging in Pine - A few days were spent in reworking some of the tree recovery value tables prepared by Spelman, primarily to determine the relative values of trees of the same diameter but with different numbers of logs.

Douglas Fir Bark Used for Tanning - During the past several years Muir and McDonald Co. of Dallas, Oregon have been using Douglas fir bark exclusively for tanning. Their products consist mainly of saddle skirting, strap and pliable sole leather for which they find a ready market in Texas. About 130 cords of bark are used annually.

Forest Survey

Douglas Fir Region - Field work on the private lands was resumed early in April. In Washington, Moravets and two field assistants will complete the type mapping of King County early in May, and Bolles and one field assistant will finish mapping Kitsap County about the middle of June. In Oregon, Buell and one field assistant started mapping Josephine County about the middle of April, and Wakeman and one field assistant completed the mapping of Curry County the latter part of April and are now assisting Buell in Josephine County. Briegleb will complete early in May the remapping of parts of Columbia and Washington Counties necessitated by the severe and extensive fires of last fall. When all these assignments are completed, probably some time in June, the field work in the Douglas fir region will be done. The balance of the survey staff has been continuing the compilation of type and volume data for areas outside the national forest boundaries. This job will continue on through the summer.

Proof copies of the new base maps of western Washington and Oregon were thoroughly checked, corrections noted and returned to Washington, D.C. The final issue should be out within the next few months.

Ponderosa Pine Region - Andrews has spent considerable time on the working plan for the inventory phase of the ponderosa pine region, and it will soon be ready for field test. For experimental purposes photostatic negatives of several C.L.C. township plats have been made and blue^{line} prints made from these. These will be used in the field mapping either directly or as a base for the vellum overlay.

New Public Domain

Field work for the new public domain study was resumed in April. It is the present plan to field map and transcribe the description of the delinquent and publicly owned lands in parts of the following seven counties in addition to the eleven already covered west of the Cascade Range: Lane, Coos and Josephine in Oregon; Clallam, Jefferson, Wahkiakum and Whatcom in Washington. One field man commenced on Lane County data April 11. Four additional men will be in the field shortly in an effort to complete this work by the thirtieth of June.

Forest Insurance

The month of April, after the tenth, Shepard devoted to a trip to Regions Four and Five for the purpose of gathering data and material on the ponderosa pine region in those regions, i.e., California and Idaho. This trip was concluded on May 4, and was highly successful throughout in spite of his encountering hectic conditions everywhere due to Conservation Corps Work.

The first eight days were spent at San Francisco and Berkeley on general data and material collection together with personal interviews with men familiar with the region. Comprehensive but not quite complete climatic data were obtained from Gray, together with full instructions as to where the balance of the data could be obtained (at the individual forest offices). In addition almost complete information was obtained as to the exact boundaries of the ponderosa pine region in the state, also an adequate picture of general protection conditions, and a bird's-eye view of general losses and the relative values of contributive and causative conditions. Dunston was working on a compilation for Mason which will fit perfectly into Shepard's needs for amounts and kinds of timber property at risk, and arrangements were made for obtaining this material when completed.

From San Francisco Shepard went to Sacramento to see Rex Black. He also saw Pratt there. At Sacramento a tour of the California forests having ponderosa pine region portions was begun. This includes the Shasta, Modoc, Lassen, Plumas, and Tahoe Forests. Because of transportation difficulties the Plumas was not visited. Data from this forest will be studied at Portland. On the other forests complete data supplementary to those obtained at San Francisco and Berkeley were collected bearing on all phases of the study, and valuable personal interviews were had. No field travel was done because of prohibitive snow conditions, but this entails no serious loss.

From the Tahoe Shepard went to Ogden and spent a day collecting data and material on southern Idaho. He also had a very profitable discussion with Shank whose fire studies work is of very definite value to him.

The following day and a half were spent in Boise in contact with Forsling and Rutledge and Hanna, the fire weather man for Idaho. Collection of material for the whole region was completed there and constructive conferences were had.

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SOUTHERN FOREST EXPERIMENT STATION

General

During the month, the Station undertook the preparation of advice in stand betterment work, forestation and nursery work in order to have this information available if it is called for in the Emergency Conservation work. Each of the three major types in the South, namely - longleaf-slash, loblolly-shortleaf hardwood and bottomland hardwood are treated separately. The information to be gotten out will, of necessity, be general in character and may be expected to serve mainly as a general guide to those who will be required to make up specific job specifications for local areas under treatment.

Management

Bull and Bickford completed during the month the thinning on 31 of the 1/4-acre thinning plots at Urania in 20 to 30 year old loblolly pine intermixed with large hardwoods. The thinnings from the plots have produced about 6,000 board feet, Doyle Scale, of sawtimber and in addition between 25 and 30 cords pulpwood. A wealth of information of immediate value is being obtained in this study as a result of the thinning operations. A series of measurements has been taken with which to check cubic foot and cordwood volume tables and to construct a local cordwood volume table as well as to determine suitable conversion factors. In addition, the amount and quality of pulpwood that can be obtained from the tops of sawlog trees is being determined. Cost records are being kept for all phases of the work in all degrees of thinning. Bull is having all slash, resulting from the thinning, piled and burned in order to head off a beetle infection and will have pulpwood and sawlogs removed from the stands in sufficient time to serve the same purpose.

Naval Stores

At the request of the Extension Forester of Mississippi, Wyman took a week's detail into that State for the purpose of demonstrating improved turpentine methods and new types of tools and equipment for chipping and cupping. Nine demonstrations were conducted in five counties in southern Mississippi with an average attendance of 16 men, mostly farmers and some turpentine hands and a number of turpentine operators. The turpentine possibilities of southern Mississippi are again becoming a matter of interest to timber owners and naval stores operators although it will probably be 8 or 10 years before Mississippi reenters the naval stores field in any large way. The present crop of timber is all second growth and, on the whole, considerably younger and smaller than is suitable for profitable operation. Before extended operations are again initiated in this large area of second growth, it will be to the best interest of every one if there is a general appreciation of the value of conservative turpentine practices. If this is not done, this beautiful stand of young timber in Mississippi will not last 15 years after wholesale operation is started.

Financial Aspects of Private Forestry

The data obtained in the survey of Union Parish, Louisiana, are being worked up in a bulletin for publication by the Louisiana Agricultural Experiment Station.

Union Parish is typical of 40 or 50 counties in northern Louisiana, southern Arkansas and northeastern Texas, in the shortleaf-loblolly hardwood region. Some of the interesting findings are: The Parish has a total area of 582,700 acres of which 62 per cent is forest land of one kind or another, but all second growth. Forest lands break down into 17 per cent well stocked with sawlog timber, 30 per cent lightly stocked with sawlog timber, 41 per cent restocking, and 12 per cent not restocking.

Farmers and small owners hold 65 per cent of the forest area. There were (in 1929) 9 mills, three of which produced over 75 per cent of the cut of the Parish. The rate of volume growth in well stocked stands averages 607 feet b.m. mill tally per annum, counting trees 9 inches d.b.h. and above. The rates on lightly stocked stands average 216 ft. per annum.

It is estimated that the annual growth in the Parish is greater than the annual mill cut of 1929, which was only a little below the average of the previous decade and is expected to be considerably above the cut for the current decade.

Red Gum Growth and Yield

The field crew of the red gum growth and yield study worked in Georgia and South Carolina in the bottomlands of the Oconee, Savannah, Santee and Wateree Rivers, locating and measuring pure stands of even-aged fully stocked old field red gum for growth and yield. It is hard enough to find such areas anywhere in the South, but in the Southeast where utilization practices are rather well advanced the crew found many of their second growth prospects already cut into and partially harvested. The men report no outstanding differences in the growth, form, and general behavior of red gum in old field stands between the Southeast and the Mississippi bottoms.

Forest Survey

The field work on the northern Mississippi pine unit was completed at the end of the month. This unit will be comprised of the 6,000,000 acres just finished and the 2,176,000 acres of the Upland Hardwood unit completed a year ago.

Eldredge and Lentz revised and simplified the Pine Working Plan with particular reference to the Central Mississippi Pine Unit. The principal changes were in connection with forest conditions and in the method of obtaining sample trees. A breakdown will be made in the second growth condition to show plots primarily in sawlog size material and plots with material below sawlog size. At least two sample trees will be taken on each plot regardless of the number of trees present. These two sample trees will be distributed through the diameter groups. If the sampling is insufficient in particular 2-inch diameter classes (as determined by office analysis), additional samples may be taken.

Pathology

Siggers made a trip to Arkansas to observe an experimental area in the Ouachita National Forest study on the rate of decay of shortleaf pine brush when treated in the following ways: (1) piled "Tee-Pee"; (2) piled and burned; (3) lopped and scattered; (4) left as it falls. Examination 3-1/2 years after logging showed that most of the brush was decayed. Where fire had not been employed there appeared to be little difference in the amount of decay whether the brush had been lopped and scattered or left where it had fallen. The amount of decay appeared to be smallest in the plots where the brush had been piled "Tee Pee" fashion. All the experi-

mental plots are located on a rather dry site with an open stand of trees growing on thin, rocky soil, with exposure varying from southeast to southwest.

Forest Products Pathology

The log treatment test established at Oakdale, Louisiana, last October was completed with results confirming those of last year - namely - that for logs cut and stored during the normal log-banking season insect attack is not a material factor in deterioration, and stain can be controlled by properly spraying with solutions of sodium tetrachlorophenolate or ethyl mercury chloride.

The completion of the commercial pole pre-treatment test established last September at Brewton, Alabama, and the examination of similarly treated stock after nine months of storage at Shreveport, Louisiana, indicated that green, freshly cut southern pine poles may be protected from stain and possibly decay through the normal seasoning period prior to pressure treatment provided the pole stock is uninfected when the initial treatment is applied, and subsequent spray treatments are applied as seasoning checks develop.

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RESEARCH ACTIVITY - REGION 2

On April 14, E. R. Lepley, Junior Forester, was transferred from his temporary experiment station assignment to the Pike Forest to assist in the spring planting activities. One week later, Ranger R. L. Williams, also under temporary assignment, left to assume his duties as district ranger on the Harney Forest. With the exception of four days spent by Williams in checking the recently compiled data in the study of growth on various plots within the Fremont Experimental Forest, the entire time of these men during April, while with the station, was employed in compiling soil temperature data for the years 1930 to 1932 inclusive, for the meteorological stations in the Fremont phase of the type study. These data have not yet been summarized so it is not possible to report any conclusions at this time.

Thinning in Douglas fir, Mt-161:

Roeser completed the work of compiling the results of observations on the occurrence and spread of "pitch girdle" infection in the sapling Douglas fir stands on the thinning study plots in Jarre Canyon on the Pike Forest. The results are interesting when considered in connection with the first report on "The Occurrence of 'Pitch Girdle' in Sapling Douglas Fir Stand on the Pike National Forest", which appeared in the Journal of Forestry, November, 1929, and in which it was reported that "thinning has been found to be helpful not only because it eliminates diseased trees, but it appears to have retarded the spread of the disease from common centers from which it tends to spread radially into the stand."

Very briefly, the results of the 1932 investigation show the following (all data are in terms of percentage):

	<u>Plot 1</u> <u>Unthinned</u> <u>(Control)</u>	<u>Plot 4</u> <u>Lightly</u> <u>Thinned</u>	<u>Plot 3</u> <u>Moderately</u> <u>Thinned</u>	<u>Plot 2</u> <u>Heavily</u> <u>Thinned</u>
Actively infected trees, 1927,	34.7	7.0	8.0	7.6
Actively infected trees, 1932,	13.9	5.7	5.3	8.2
Newly infected trees since 1927,	2.5	2.1	1.3	4.0
Losses due to "pitch girdle" since 1927,	6.5	2.1	0.6	0.7

The above data are based on the total number of trees in the various stands in 1932.

Fate of Actively Infected Trees in 1927

	<u>Plot 1</u>	<u>Plot 4</u>	<u>Plot 3</u>	<u>Plot 2</u>
Dead (killed by pitch girdle)	12.4	7.7	1.3	6.5
Dead (killed by other causes)	0.4	0.9	0	0
Still actively infected	22.4	23.1	20.3	21.7
Recovered	64.8	68.3	78.4	71.8

The recovered trees show all indications of having overcome the attacks of the disease, although it must be admitted that too little is known about the disease to permit of any unqualified judgment as to what constitutes a "recovered" case.

The evidence to date indicates that thinning helps to the extent in which it removes diseased trees and reduces the probability of mortality following infection. Very likely this latter condition reflects a physiological situation relating to competition. Trees released from competition are apparently favored in their struggle against the disease according to the degree of release. However, the results do not indicate that thinning reduces the infection rate, or the rate of spread to healthy trees. The results obtained on the heavily thinned plot are particularly out of line in this regard. Since the disease has not yet been identified, it is patent that considerable study needs yet to be made in order that its nature may be understood.

Type Study, T-1:

In addition to helping in rounding up the compilation of soil temperature statistics for the Fremont stations in the type study, Roeser also compiled the precipitation records for the period 1930 to 1932 inclusive for the Monument station (M-1) and for the two Bessey plantation stations (H-1 and H-2) on the Nebraska Forest. In the fall of 1930, a rain gauge was installed at the meteorological station that is located in one of the earliest established jack pine plantations on the Nebraska Forest in order to determine the relation of the canopy (in which individual crowns now extend upward

to approximately 30 feet) to the amount of precipitation that reaches the ground as compared with that falling in the open. For the two-year period, January 1, 1931 to December 31, 1932 (during which it was very dry), the record is as follows:

	Station H-1 In open (Inches)	Station H-2 In unthinned plan- tation approx. 30 years old (Inches)
Total precipitation for two years	33.70	25.90
Total growing season precipitation (May to September, incl.)	24.90	18.59
Total winter season precipitation (Oct. to April, Incl.)	8.80	7.33
Total snowfall for two years	48.7	43.5

The amount of precipitation reaching the ground under the stand was 77 per cent of that in the open. Apparently a larger percentage of the moisture in the form of snow fell to the ground than in the form of rain, but this part of the record may be questioned. While a complete record of snow depth was not obtained, data are available for nine months and these show that the average depth of the snow (measured at 8 a.m. each day) for these months was 1.74 inches under the forest canopy and 1.61 inches in the open. The difference is small, and this may be attributed to the very light snowfall during the two-year period of observation. In fact, the moisture situation in general was abnormal, since the normal annual precipitation at the Bossey Nursery is about 21 inches.

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